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ABSTRACT

The primary research problem confronting many experimental researchers is finding valid stimulus (instructional) and criterial (testing) materials that operationally fit their hypotheses. Five experimental studies have been completed, and two are in progress, using the Dwyer instructional materials to address the problem of finding valid instructional materials that are typical of classroom learning experiences and can be operationally defined in specific psychological terms. Studies used instructional slide tape programs of three types: (1) line drawings with a colored background; (2) illustrations in color; and (3) realistic photographs in color. All of these can be operationally defined as having an effect on abstraction because of the difference between relevant and irrelevant information contained in each set. The Dwyer criterial materials can be operationally defined in specific information-processing terms also, with the drawing test considered a spatial-learning and list-learning task, the terminology test either a simple or conjunctive concept-learning task, and the comprehension test either a complex or relational concept-learning task. The Dwyer materials have been found effective and valid for use in these research studies. (LMM)

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A Psychological Rationale for The Experimental Application of The Dwyer Stimulus and Criterial Materials in Instructional Theory Research

Invited Panel Discussion Presentation,
AECT National Convention, Dallas, Texas, 1982

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Introduction

A series of experimental studies have been conceptualized and conducted by Drs. William Taylor, Ohio State University, and James Canelos, The Pennsylvania State University, using the Dwyer stimulus and criterial materials. These studies have investigated the general and specific effects of external learning conditions on the internal psychological state of the cognitive structure. We found that the Dwyer stimulus and criterial materials could be operationally defined in specific psychological learning terms, and this led to a variety of experimental possibilities dealing with external (environmental) and internal (cognitive) instructional and learning hypothesis. The following experimental studies have been conducted or are currently in progress using the Dwyer materials:

Completed

1) The Effects of Three Levels of Visual Complexity on the Information Processing of Field-Dependents and Field-Independents When Acquiring Instructional Information for Performance on Three Types of Educational Objectives, Journal of Instructional Psychology, Vol. 7, No. 2, pp. 65-70, 1980 (Canelos, J.; Taylor, W; Gates, R.).

2) The Effects of a Networking Information Processing Strategy on the Learning of Field-Dependents When Receiving Visual Instructional Information, Journal of Experimental Education, Vol. 50, No. 1, pp. 42-46, 1981 (Canelos, J.; Taylor, W.).

3) The Instructional Effectiveness of Three Content-Independent Imagery Learning Strategies on Different Learning Outcomes When Learners Received Visualized Instruction of Varying Complexity, Journal of Experimental Education, in press, Heldref Publications, Washington, D.C., 1982 (Canelos, J.).

4) Content Independent Learning Strategies and Their Relative Effectiveness on Acquiring Concept Information and Spatial Information When Learning from Visualized Instruction, Presentation at the 1982 AECT National Convention, Dallas, Texas, published in Research and Theory Division Proceedings, 1982 (Canelos, J.; Taylor, W.; Altschuld, J.).

5) The Instructional Effectiveness of Three Content-Independent Imagery Learning Strategies on Different Learning Outcomes When Learners Received Visualized Instruction of Varying Stimulus Complexity, Winning research effort of the Association for Educational Communications and Technology, Research and Theory Division, 1982 Young Researcher Award, National Competition, 1982 (Canelos, J.).

In Progress

6) The Effects of Cued Recall and Free Recall on the Long-Term Retention of Learning from Visual Instructional Materials, The Pennsylvania State University, 1982-83 (Canelos, J.; Taylor, W.).

7) The Relative Effectiveness of a Visual Advance Organizer and a Verbal Advance Organizer When Learning from Visualized Instruction, The Pennsylvania State University, 1982-83 (Canelos, J.; Taylor, W.).

Problem and Rationale

The research problem confronting many experimental researchers is not so much designing unique studies but finding criterial and stimulus materials that are valid and that operationally fit their hypothesis. Such materials can usually be developed and in many cases this is the only solution. However, this will involve time and considerable expense. In addition, many experimental studies use simplistic and totally unrealistic learning and testing materials, making generalization to the classroom difficult at best. The Dwyer stimulus materials represent a typical academic instructional program on the human heart. Most school learners have experienced similar mediated instruction and therefore the Dwyer stimulus materials are not significantly different from school learning conditions. The same is true of the Dwyer testing materials. These dependent measures are representative of typical classroom testing conditions students are familiar with.

The Dwyer stimulus and criterial materials are very typical of academic learning and testing conditions, making experimental results using these materials quite generalizable to real classroom learning-testing conditions. The fact that the instructional materials deal with a heart instructional program is irrelevant unless the subject pool has significant prior knowledge of heart physiology. What is relevant is that the various slide-sets which make up the visual variable of the heart instructional programs can be defined in specific operational terms. Additionally, the tests on the heart learning program can be defined in terms of specific psychological learning factors.

Solution

To address the specific experimental problem of using valid instructional materials (stimulus materials) and testing materials (criterial materials), in the Canelos, et. al., studies, the Dwyer stimulus and criterial materials were used. The series of studies previously cited dealt with internal cognitive factors as well as external stimulus conditions. The problem we faced was finding, or developing, stimulus and testing materials that were typical to classroom learning experiences, and could be operationally defined in specific psychological terms.

The Dwyer materials fit these two requirements in the following way:

1) Dwyer Instructional Program on the Human Heart.

The Dwyer instructional program used in the Canelos, et. al., studies was the slide-tape program. Three visual program types were

used: (a) line drawings with a colored background, (b) illustrations, in color, (c) realistic photograph, in color. Each of these program types can be operationally defined in terms of the psychological abstraction process by the amount of relevant or irrelevant material contained in the visual sets. The first operation in information processing is selective attending or selective perception. During attending the individual selects relevant information from irrelevant information, this defines the abstraction process (e.g., abstracting relevant data from background data). Therefore, the addition of, or deletion of, irrelevant information should significantly effect learning.

The three Dwyer instructional program slide sets used were operationally defined as having an effect on abstratcion because of differences between relevant and irrelevant information contained in each set

a) The line drawing slide set contained the lowest amount of irrelevant data.

RRRRRRR	II

(R = relevant; I = irrelevant)

b) The illustration drawing slide set contained an equal amount of relevant and irrelevant data.

RRRRRRR	IIIIIII

c) The realistic photograph slide set contained more irrelevant than relevant data

RRRRRRR	IIIIIIIIIIIII

Additionally, the instructional programs contained exactly the same amount of to-be-learned information since each used the same audio script.

2) Dwyer Testing Materials on the Heart Programs.

The Dwyer testing materials can be operationally defined in specific psychological information processing terms. The tests used in the Canelos, et. al., studies were derivations of (a) the Drawing Test, (b) the Terminology Test, (c) the Comprehension Test.

The Drawing Test can be operationally defined as a spatial learning task and a list learning task. A spatial learning task will involve

the use of imagery information learned from the heart programs and knowledge of spatial relationships among and between the parts of the heart. This spatial learning is different than verbal learning and usually interacts with other experimental variables such as cognitive style or learning strategy. The list learning part of the Drawing Test involves the identification of, or listing of, the heart part names. List learning can be defined as a very simple learning task involving the recall or recognition of a list of names. Interestingly, this list learning task is usually what is found with typical experimental learning studies!

The Terminology Test can be operationally defined as a simple concept learning task or conjunctive concept learning task. In this case, the learner is given a short description and he must classify, from a number of choices, what this description defines. This type of learning task is different from list learning, spatial learning, and complex concept learning. Additionally, this learning task fits the true definition of concept learning (e.g., a concept is a classification rule, allowing the person to classify what is or what is not in that conceptual category).

The Comprehension Test can be operationally defined as a complex concept learning task or a relational concept learning task. The Comprehension Test requires that the learner understand relationships between simple concepts or facts. A relational concept is typically quite difficult since several bits of information must be combined to solve the conceptual problem.

Conclusion

The Canelos, et. al., studies used only a portion of the Dwyer stimulus and criterial materials. There are additional slide sets and programmed learning materials on the heart as well as additional testing conditions. We have found that the Dwyer stimulus and criterial materials are effective since they can be operationally defined in terms of specific psychological variables. Additionally, they are valid and represent materials allowing for a reasonable generalization to the classroom situation.